OSHA's Impact on Industry

1974

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OSHA'S IMPACT ON INDUSTRY

BY

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B.S., Michigan State University, 1955
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RESEARCH REPORT

Submitted in partial fulfillment of the requirements for the degree of Master of Science in Environmental Systems Management in the Graduate Studies Program of Florida Technological University

Orlando, Florida
1974
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ABSTRACT

On December 29, 1970, the President signed into law the Williams-Steiger Occupational Safety and Health Act (OSHA) of 1970, which became effective April 28, 1971. The purpose of this act is to assure safe and healthful working conditions for the nation's wage earners. The law provides that each employer has the basic duty to furnish his employees a place of employment which is safe from recognized hazards that cause death or serious physical harm.

The implementation of the OSHA Act has been the most extensive intervention into the day-to-day operation of American Industry in history. Originally, employers expressed doubt that they could meet requirements of the OSHA standards and remain in business.

This investigation reveals that a concentrated effort to organize a safety group trained in OSHA standards and a program for identifying costs for correction can lead to an economical compliance program which is advantageous to the employer and employee as well.

Three aerospace firms were investigated for the impact of OSHA. Results show that approximately $400,000 will bring each of these firms into compliance. Compliance cost, however, is greatly determined by the type of industry, age of facility, and the safety program in effect at the facility.
INTRODUCTION

More than 14,500 workers are killed and 2,200,000 workers are disabled in America each year as a result of work-related accidents. This represents a loss of about 250 million nonproductive days of work. The cost to the country and its effect on the nation's economy, in addition to the human considerations, compel attention. Annually, lost wages exceed 1 1/2 billion dollars and the loss to the Gross National Product is put at more than eight billion dollars.\(^1\)

About a dozen years ago, the national injury rate began to increase after years of steady decline. While the reason for this has not been established, it has become a matter of utmost concern of corporation management, unions, the Congress, and safety-minded people and organizations, and was the prime force behind the Occupational Safety and Health Act (OSHA).\(^2\)

There have been a great many laws enacted over the years by the Congress, many of which receive little attention and are hardly recognized as the law of the land. But not a single piece of legislation enacted into law has had quite the impact on industry that the Occupational Safety and Health Act of 1970 has had. The reason is

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that the law was needed to perform a service that all appreciated as necessary to protect the health and safety of the worker.

The mandate of Congress in the Williams-Steiger Occupational Safety and Health Act and the purpose of OSHA is "to assure as far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources." Stated intent of those who will administer the act is to enforce it vigorously while continuously improving safety and health standards so that progress toward its goals will be evident in the near future.³

The reaction of most industry and employees in general has been cautious. Employers generally recognize the advantage to themselves from greater safety: reduced accidents and illness, increased productivity, and decreased compensation costs.⁴

At the same time there are those who fear the effects of interference in plant operation by overzealous and misinformed inspectors. Some employers are concerned because they have simply let safety practices slip under the day-to-day pressures of business.

There has been a profound impact on corporate management by the OSHA Act. The reaction of industrial firms has been that no act has had a price tag to equal that of OSHA. While no one has attempted an exact accounting estimate of OSHA's total cost to the U.S., industry estimates it to run into tens of billions of dollars. A few

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industries will get off lightly, but costs of operations in many could rise considerably over the immediate years.  

This investigation was directed towards the costs associated with the act to industry over the past few years, the impact on three aerospace firms and the associated safety program, and the effect on product cost because of the impact of OSHA on suppliers.

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CHAPTER I
HISTORY

The provisions of the Occupational Safety and Health Act of 1970 apply to every employer engaged in a business affecting commerce. Employers under the Act have the duty to furnish each of their employees employment and places of employment, free from recognized hazards causing, or likely to cause, death or serious physical harm; and the employer has the specific duty of complying with safety and health standards generated under the Act. Each employee has the duty to comply with these safety and health standards, and all rules, regulations, and orders issued which are applicable to his own action and conduct.

Administration and enforcement of the Act is vested primarily in the Secretary of Labor and in the Occupational Safety and Health Review Commission, a board of three members appointed by the President. Research and related functions are vested in the Secretary of Health, Education and Welfare whose safety function is conducted by the National Institute for Occupational Safety and Health established within HEW.

The Secretary of Labor is responsible for both promulgating and enforcing job safety and health standards. Occupational safety and health inspections are made by inspectors located in field offices.

In general, job safety and health standards consist of rules for avoidance of hazards which have been proven by research and experience to be harmful to personal safety and health. A great many
standards apply only to workers engaged in specific types of work—such as handling compressed gases. It is the obligation of all employers and employees to familiarize themselves with those standards which apply to them and to observe them at all times.

The Act authorized the Secretary of Labor until April 28, 1973 to promulgate as occupational safety and health standards any existing Federal Standards or any national consensus standards. The Secretary of Labor may, upon basis of information submitted by the Secretary of Health, Education and Welfare advisory committees and others, revise, modify or revoke existing standards as well as develop new ones.

The Act also provides for the establishment of emergency temporary standards, effective upon their publication in the Federal Register, when it is found that employees are exposed to grave danger. The Act contains provisions for standards which may require:

1. That no employee dealing with toxic materials or harmful physical agents will suffer material impairment of health or functional capacity, even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life.

2. Development and prescription of labels or other appropriate forms of warning so that employees are made aware of all hazards to which they are exposed.

3. Prescription of suitable protective equipment.
4 Monitoring or measuring employee exposure to hazards at such locations at such intervals as may be necessary for the protection of employees.

5 Prescription of the type and frequency of medical examinations or other tests for employees exposed to health hazards. At the request of an employee, the examination or test results shall be furnished to his physician.

The Secretary of Labor, after a hearing on an employer application, is authorized to grant temporary variances from standards to give the employer sufficient time to come into compliance if he can show a need for certain time-extension and has a protective plan of action. Variances may be granted without time limits if the Secretary finds that an employer is using safety measures which are as safe as those required in a standard. Affected employees shall be given notice of each such application and an opportunity for hearing.6

A. Violations

Any employees who believe that a violation of a job safety or health standard exists which threatens physical harm, or that an imminent danger exists, may request an inspection by sending a signed written notice to the Department of Labor. Such a notice shall set forth with reasonable detail the grounds for the notice, and a copy shall be provided the employer or his agent. The names of the complainants need not be furnished to the employer. If the Secretary

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finds no reasonable grounds for the complaint and a citation is not issued, the Secretary is required to notify the complainants.

In enforcing the standards, Labor Department safety inspectors may enter any establishment covered by the Act at any reasonable time to inspect the premises and all pertinent conditions, structures, machines, apparatus, devices, equipment, and materials and to question privately any employer, owner, operator, agent or employee. The Act permits the employer and a representative authorized by his employees to accompany the inspector during the physical inspection of any workplace for the purpose of aiding such inspection.

Where an investigation reveals a violation, the employer is issued a written citation describing the specific nature of the violation. Each citation issued by the Department must be prominently posted at or near each place where the violation referred to in the citation occurred.

Within a reasonable time after issuance of a citation for a job safety or health violation, the Labor Department shall notify the employer of the proposed assessment. The employer then has 15 working days within which to notify the Department that he wishes to contest the citation or proposed assessment of penalty. If the employer fails to notify the Department within such time that he intends to contest the citation or proposed assessment of penalty, the citation and the assessment shall be final, provided no employee files an objection to the time allowed for abatement. If the employer notifies the Department within such time that he does wish to contest, the Secretary of Labor will so advise the Occupational Safety and Health Review Commission and the Commission shall afford an opportunity for a hearing.
The Commission then will issue orders affirming, modifying, or vacating the citation or proposed penalty. Orders of the Commission are final 30 days after issuance. Review of Commission orders may be obtained in the United States Court of Appeals.

A citation issued shall prescribe a reasonable time for elimination or abatement of the hazard. This time limit may be contested if notification is filed with the Department for correction. A violation shall not take effect until there is a final order of the Review Commission.

Employees also have the right to object to the period of time fixed in the citation for the abatement of a violation. If, within 15 days after a citation is issued, an employee files a notice with the Department alleging that an unreasonable time was allowed for abatement, review procedures similar to those specified above apply.

Where time for correction of a violation is allowed but the employer fails to abate within such time, the Secretary of Labor shall notify the employer by certified mail of such failure and of the proposed penalty. Such notice and assessment shall be final unless the employer contests by notice to the Secretary within 15 days.

When an employer has shown good faith by making an effort to comply with the abatement requirements of a citation, but that abatement has not been completed because of factors beyond his reasonable control, an opportunity for a hearing will be afforded after which an order affirming or modifying the abatement requirement will be issued.

Willful or repeated violations of the Act's requirements by employers may incur monetary penalties of up to $10,000 for each violation, while penalties of $1,000 may be incurred where a nonserious
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undertaken. The Secretary of Labor, in cooperation with the Secretary of Health, Education and Welfare, is authorized by the law to issue regulations which shall provide employees or their representative with an opportunity to observe such monitoring or measuring, and to have access to the records.

For recordkeeping purposes, the Secretary's regulations also require employers to conduct their own periodic inspections.8

C. Coordination

The Secretary is directed to issue regulations requiring employers to keep their employees informed of their protection and obligation under the law through posting of notices or other appropriate means. The information which employers may be required to give their employees may also include the provisions of applicable standards.

The Secretary of Labor, in consultation with the HEW Secretary, is required to develop and maintain an effective program of collection, compilation and analysis of statistics on work injuries and illnesses. The Secretary may also require employers to file such reports of work injuries and illnesses required to be kept under the Act as he shall deem necessary.

Existing agreements between the Department of Labor and a State for collection of OSHA statistics are preserved under the Act until replaced by other arrangements under grants or contracts made under the Act.

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The Secretary of Labor is required to publish in the Federal Register a statement of his reasons for any action he takes with respect to the promulgation of any standard, the issuance of any rule, order or decision, the granting of any exemption or extension of time, as well as any action he takes to compromise, mitigate or settle any penalty assessed under the Act.

Any conditions or practices in any place of employment which constitute a danger which could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated through normal enforcement procedures, may be restrained by order of a United States district court upon petition of the Secretary of Labor. If the Secretary arbitrarily fails to seek action to abate imminent danger, an action to compel him to act may be brought in the U. S. district court by any employee who may be injured by reason of such failure. A Labor Department safety inspector who concludes that such imminent-danger conditions or practices exist in any place of employment is obligated to inform the affected employees and employers of the danger and of his recommendation to the Secretary of Labor that relief be sought.

No person may discriminate against any employee because he exercises any right under the Act or files a complaint or because he testifies or is about to testify in any proceeding under the Act. Any employee who believes that he has been discharged or otherwise discriminated against in violation of this provision may, within 30 days of such illegal action, file a complaint with the Secretary of Labor.

The Act provides for programs to be conducted by the Secretary of Labor, in consultation with the Department of Health, Education and
Welfare, for the education and training of employers and employees in the recognition, avoidance, and prevention of unsafe and unhealthy working conditions, and in the effective means for preventing occupational injuries and illnesses. It also makes provision for educational and training programs to provide an adequate supply of qualified personnel to carry out the law, and for informational programs on the importance and proper use of adequate safety and health equipment to be conducted primarily by the Department of Health, Education and Welfare. 9

D. National Institute for Occupational Safety and Health

The Occupational Safety and Health Act establishes within HEW a new National Institute for Occupational Safety and Health (NIOSH) primarily for the purpose of carrying out the research and educational functions assigned to the HEW Secretary under the Act.

In addition to these functions, the Institute is authorized to develop and establish recommended occupational safety and health standards; to conduct research and experimental programs determined by the Institute's Director to be necessary for developing criteria for new and improved job safety and health standards; and to make recommendations to the Secretaries of Labor and HEW concerning new and improved standards.

Among the HEW functions which may be carried out by NIOSH is one which calls for prescribing regulations requiring employers to measure, record, and make reports on the exposure of employees to

potentially toxic substances or harmful physical agents which might endanger their safety and health. Employers required to perform this action may receive full financial or other assistance for the purpose of defraying any additional expense. Also authorized to be conducted by NIOSH are programs for medical examinations and tests as may be necessary to determine, for the purposes of research, the incidence of occupational illness and the susceptibility of employees to such illnesses.¹⁰

CHAPTER II
INVESTIGATION AND ANALYSIS

There are few operating areas in the United States industry that are not being changed and controlled by the new Occupational Safety and Health Act. Capital and operating expenses are on the increase, record keeping is proliferating, new in-plant safety staffs must be expanded and employees can now initiate an OSHA inspection.

Firms, which have generally a poor safety record, are much more vulnerable than large firms with an available, active, well staffed safety program. Most of the small firms do not have safety departments and lack the trained personnel to set up a safety program. In addition, small firms will have difficulty compiling all the information necessary to determine whether they are, or are not, in compliance with all of the federal standards.\footnote{Joan M. Nilsen, "OSHA: Acronym for Trouble," Chemical Engineering, March 20, 1972, pp. 58-60.}

This investigation covered four areas of OSHA impact on industry: 1) implementation of the OSHA standards, 2) the impact on the overall general industry complex, 3) a review of three aerospace firms’ OSHA compliance costs and the related OSHA plant safety program, and 4) product cost affected by OSHA compliance requirements.

A. Implementation

The authorization in the OSHA law provides for the use of consensus standards for the interim period from the approval of the law and
ending in April 1973. At and subsequent to that date, OSHA will promulgate its own safety standards which it will enforce. When standards are developed by the consensus method there are inevitable conflicts that develop between them as one standard is revised before another and the two standards are interrelated.

The procedure for standards promulgated after April 1973 requires extensive time-consuming hearings to bring out all points of view. Such hearings are expensive and, while necessary for complete fairness to the industrial world, are not the most efficient method for revising a standard. It would be far easier for a committee of experts representing all major points of view to consider the various aspects of standards and to make proper planned revision expeditiously.12

For standards development in the overall OSHA program, the task has been divided into three phases. The first was an emergency phase during which existing Federal Standards and available material consensus standards were adopted under the provisions of the act as mandatory for industry and business to follow. Many of these standards were developed within the American National Standards Institute (AMSI) and the National Fire Protection Association (NFP). During the second phase these standards are being revised to make them more suitable for mandatory enforcement. The third phase will develop entirely new standards in areas where few or none exist, and it is at this point that OSHA looks to new allies in the national consensus standards field. A provision

in the act allows employers to develop substitute standards if they can demonstrate that they are an improvement over existing standards. 13

Measuring the relative performance of safety or health procedures or devices with accuracy is difficult, because few methods exist. The organizations that performed the original research and gathered the necessary engineering data years ago did not have the benefit of the sophisticated data processing and storage methods available today. As a result, much of the original data upon which the occupational safety and health standards were based are no longer present in retrievable form. Therefore it is impossible to compare new practices or devices against the original parameters.

For example, there is no way of determining with certainty why a certain dimension or material was specified in the old safety standard. The only solution during the third phase of the program is to define all over again what it is that is needed, how to get it, and how to measure it once it is achieved.

Department of Labor is going to need far more research and engineering data to back up proposed standards during the third phase. Under the provision of the Safety and Health Act, each proposed standard may be reviewed at a hearing if it is requested, and the voices opposing the adoption of a new standard will be heard.

Industry must understand that safety and health standards will be a constant evolution and the books of standards will change every

year as new manufacturing techniques and more sophisticated machinery are made available.  

As previously stated, the Act provides for cooperation with the Department of Health, Education and Welfare, which has established within its department a National Institute for Occupational Safety and Health (NIOSH). The function of NIOSH will be to carry out research and education duties that are assigned to HEW under the Act, and research and experiments leading to the development of new standards. These standards, however, will be promulgated by the Department of Labor under provisions of OSHA.  

B. Impact on Industry

A recent field check, subsequently followed by a mail survey of 1,000 safety directors, revealed that most of the safety managers were planning to spend more for safety and for occupation health needs in 1974 than had ever been spent in any preceding year. OSHA continues to provide the primary, though by no means the sole, impetus for the increased spending. The safety director for a forging plant employing 2,000 said that his safety expenditures will be up 20 percent for the coming year. He was expecting to spend $200,000 on press guarding controls alone to bring his plant into compliance with the new power press standard that became effective in 1974. The addition of dust and fume control and an extensive sprinkler installation program for fire protection are also in the planned effort. In the long term, the safety

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director calculated that a $4 million allocation will be needed to bring his plant into "spit-and-polish" compliance with OSHA standards.

Although all those items are immediately necessary to comply with the law, the company did not believe they could stay solvent if they were to complete the total effort in one year. They planned to spread the effort over a five year period, spending at the rate of $800,000 a year.16

Most of the cited reasons for the marked increase is due to OSHA. Because of OSHA, plant management is now more aware of unsafe conditions. Plant managers are looking ahead to future standards and compliance needs. For example, in view of the August 1974 effective date for the hands-out-of dies provision of OSHA's power press standard, many safety chiefs spent money to bring their power presses into compliance early.

The Occupational Hazards Magazine learned, in a survey of 1,000 safety directors who regularly receive the magazine, that twenty-nine percent will have the same budget as they had in 1973, only 4.5 percent will have a lower budget, while 66.5 percent will increase their budget from last year. Table 1 shows the 1974 budget trends of 1,000 industrial safety directors in safety, industrial hygiene, fire protection, and security. That portion which is solely responsible for OSHA is not detectable but as mentioned earlier, the directors surveyed cited OSHA as the main reason for the increase planned expenditures.17


<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>1974 BUDGET TREND SURVEY*</th>
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<table>
<thead>
<tr>
<th>SAFETY budgets:</th>
<th>Safety directors whose SAFETY budgets are up reported these rates of increase:</th>
</tr>
</thead>
<tbody>
<tr>
<td>66.5% will be up</td>
<td>13% will be up from 1-9%</td>
</tr>
<tr>
<td>29% will stay the same as '73</td>
<td>67% will be up from 10-25%</td>
</tr>
<tr>
<td>4.5% will be down</td>
<td>20% will be up more than 25%</td>
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</tbody>
</table>

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<tr>
<th>INDUSTRIAL HYGIENE budgets:</th>
<th>Safety directors whose INDUSTRIAL HYGIENE budgets are up reported these rates of increase:</th>
</tr>
</thead>
<tbody>
<tr>
<td>59% will be up</td>
<td>12.5% will be up from 1-9%</td>
</tr>
<tr>
<td>36.5% will stay the same as '73</td>
<td>66% will be up from 10-25%</td>
</tr>
<tr>
<td>4.5% will be down</td>
<td>21.5% will be up more than 25%</td>
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<th>FIRE PROTECTION budgets:</th>
<th>Safety directors whose FIRE PROTECTION budgets are up reported these rates of increase:</th>
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<tr>
<td>34.5% will be up</td>
<td>14% will be up from 1-9%</td>
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<tr>
<td>59.5% will stay the same as '73</td>
<td>70.5% will be up from 10-25%</td>
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<tr>
<td>6% will be down</td>
<td>15.5% will be up more than 25%</td>
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<th>SECURITY budgets:</th>
<th>Safety directors whose SECURITY budgets are up reported these rates of increase:</th>
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<tr>
<td>36% will be up</td>
<td>20.75% will be up from 1-9%</td>
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<tr>
<td>59% will stay the same as '73</td>
<td>62% will be up from 10-25%</td>
</tr>
<tr>
<td>5% will be down</td>
<td>17.25% will be up more than 25%</td>
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</table>

**"The Safety Director: 1974's Big Spender," Occupational Hazards, December 1973.**
According to the Budd Company's safety expert, major expenses to their company caused by OSHA compliance are the updating of stamping presses, material handling equipment and electrical facilities. Now every plant has to have a grounded (3-wire) electrical system.

The Budd Company is expected to spend some $16 million to inspect and update 1752 metal stamping presses in order to come into OSHA compliance. In addition the routine safety costs are expected to range at about $170 per man for the year. This is due to their extensive safety program even before OSHA and the increases necessary to assure OSHA compliance.

The Budd Company did ask for some variances which were granted that kept the cost from elevating even higher.18

Dr. Peter Wolkonsky, Medical Director for Standard Oil Co. of Indiana and associate at Northwestern University School of Medicine conducted a comprehensive study on the cost impact of the recent safety-health legislation including OSHA. It covers 29 top corporations employing 2.2 million workers.

The study reports that the average medical department among the companies surveyed employed 19 full-time physicians, 8 industrial hygienists and a nurse-clerical staff consisting of about 72 people.

Since 1968 to 1972 the same companies increased their effort to 22 full-time MD's and 10 bioscientists, with proportionate increases in the nursing and secretarial staffs. This comes to approximately a 14 percent jump in company doctors and a 20 percent boost in hygiene-bioscience personnel.

Applying estimates of $32.80 cost per employee in 1971 with 2.2 million workers would result in a total annual cost of $72 million for the companies surveyed. Using these data, plus the Department of Labor figure of 60 million workers covered by OSHA, Dr. Wolkonsky surmises that "to provide all such workers with an average medical and health program will require 17,000 full time physicians and cost about $2 billion annually."

Based on these requirements and cost he concludes that with the present physicians shortage and lack of money, it is doubtful that full implementation of this legislation is possible in any realistic and timely way. 19

The compliance with OSHA standards does not come cheaply, but in the long run, the investment should lower costs for Workmen's Compensation and reduce lost time and down time from accidents and illnesses, resulting in a net gain for industry.

A recent McGraw-Hill Publications survey showed business spending for employee safety and health rising substantially in 1973 and in years to come. Tables 2 and 3 show the costs per year and percent of capital spending for different industries, respectively. 20

1 In 1972, business investment in employee safety and health topped $2.51 billion or 2.8 percent of all capital spending.

2 In 1973, that investment will increase to $3.16 billion or 3 percent of capital spending--a 26 percent increase.


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<tbody>
<tr>
<td>Iron and steel</td>
<td>$193</td>
<td>$215</td>
<td>11%</td>
<td>$478</td>
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<tr>
<td>Nonferrous metals</td>
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<td>46</td>
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<td>Electrical machinery</td>
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<td>Machinery</td>
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<td>131</td>
<td>52</td>
<td>213</td>
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<td>Auto, trucks and parts</td>
<td>88</td>
<td>74</td>
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<td>65</td>
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<td>Aerospace</td>
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<td>Other transportation equipment</td>
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<td>Fabricated metals</td>
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<td>Instruments</td>
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<td>Stone, clay and glass</td>
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<td>Textiles</td>
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<td>86</td>
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<tr>
<td>Railroads</td>
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<td>34</td>
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</tr>
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<td>Airlines</td>
<td>54</td>
<td>55</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>Other transportation</td>
<td>70</td>
<td>66</td>
<td>6</td>
<td>73</td>
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<tr>
<td>Communications</td>
<td>404</td>
<td>569</td>
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<tr>
<td>Electric Utilities</td>
<td>203</td>
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<td>445</td>
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<td>Gas Utilities</td>
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<tr>
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<td>21</td>
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<tr>
<td>All business</td>
<td>2,509</td>
<td>3,156</td>
<td>26</td>
<td>3,563</td>
</tr>
</tbody>
</table>

*John Stender, "What does it cost to comply with OSHA?," Occupational Hazards, October 1973, p. 115.
### TABLE 3

**EMPLOYEE SAFETY AND HEALTH INVESTMENT AS PERCENT OF CAPITAL SPENDING***

<table>
<thead>
<tr>
<th>Industry</th>
<th>Actual 1972</th>
<th>Planned 1973</th>
<th>Planned 1976</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron and steel</td>
<td>12.3%</td>
<td>10.6%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Nonferrous metals</td>
<td>3.1</td>
<td>2.4</td>
<td>5.2</td>
</tr>
<tr>
<td>Electrical machinery</td>
<td>2.4</td>
<td>2.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Machinery</td>
<td>3.0</td>
<td>3.2</td>
<td>5.4</td>
</tr>
<tr>
<td>Autos, trucks and parts</td>
<td>4.8</td>
<td>3.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Aerospace</td>
<td>3.3</td>
<td>4.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Other transportation equipment</td>
<td>2.4</td>
<td>3.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Fabricated metals</td>
<td>1.3</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Instruments</td>
<td>1.7</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Stone, clay and glass</td>
<td>2.5</td>
<td>4.3</td>
<td>4.7</td>
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<tr>
<td>Other durables</td>
<td>2.3</td>
<td>2.7</td>
<td>2.1</td>
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<tr>
<td>Total durables</td>
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<td>3.6</td>
<td>5.2</td>
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<td>2.2</td>
<td>3.1</td>
</tr>
<tr>
<td>Paper</td>
<td>3.6</td>
<td>3.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Rubber</td>
<td>1.4</td>
<td>2.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Petroleum</td>
<td>1.3</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Food and beverages</td>
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<td>3.5</td>
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<tr>
<td>Textiles</td>
<td>7.9</td>
<td>8.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Other nondurables</td>
<td>1.9</td>
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<td>2.6</td>
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<tr>
<td>Total nondurables</td>
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<tr>
<td>All manufacturing</td>
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<tr>
<td>Mining</td>
<td>3.5</td>
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<tr>
<td>Railroads</td>
<td>1.7</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Airlines</td>
<td>2.2</td>
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<td>Other transportation</td>
<td>4.8</td>
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<tr>
<td>Communications</td>
<td>3.4</td>
<td>4.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Electric utilities</td>
<td>1.4</td>
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<td>2.1</td>
</tr>
<tr>
<td>Gas utilities</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Commercial</td>
<td>3.5</td>
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<td>2.1</td>
</tr>
<tr>
<td>All nonmanufacturing</td>
<td>2.8</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>All business</td>
<td>2.8</td>
<td>3.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

By 1976, business spending for safety and health will rise another 13 percent to $3.56 billion, but hold at the level of 3 percent of capital spending. The slowing rate of increase was attributed to the many one-time cost safety items industry will have purchased from 1972 through 1975.

Specifically, the survey shows that the cost for 1972, plan for 1973 and percent change for the aerospace industry is 14 million, 26 million, and 86 percent, respectively. In addition the survey shows approximately 4.1 percent of capital spending for OSHA compliance in 1973.

Not surprisingly, the survey showed the sharpest increase among manufacturers. Their 1973 tab will run about $1.26 billion, 34 percent more than in 1972.

Douglas Greenwald, McGraw-Hill's chief economist, said the gains in safety and health spending are "obviously a direct reflection of how the 1970 Occupational Safety Health Act is affecting business."

The McGraw-Hill study was part of its annual survey of business capital investment. Companies included in the survey control 60 percent of business spending. The year, 1973, was the first time the companies were asked about safety and health spending.

In another survey, the National Association of Manufacturers queried 1,150 member companies about OSHA. The NAM Survey showed that the cost of complying with OSHA standards averaged:

$33,000 for plants with less than 100 employees
$104,000 for plants with 100 to 500 employees
$212,000 for plants with 500 to 1,000 employees
$372,000 for plants with 1,000 to 2,000 employees
$863,000 for plants with 2,000 to 5,000 employees

$1 million to $7 million for plants with more than 5,000 employees

Although clearly the cost of compliance with OSHA standards and the increasing costs of employee safety and health programs are substantial, these costs are dwarfed by estimates of the annual cost of accidents to industry.

According to the National Safety Council's latest figures, accidents cost industry $11.5 billion in 1972. This estimate includes $2.6 billion in lost wages for injured workers, $1.6 billion in insurance administration costs, $1 billion in medical costs, $5.2 billion in lost wages for workers not directly involved in accidents who stopped to help or who conducted accident investigations, and $1.41 billion in direct fire losses. The cost of property damage from accidents is not included.

The latest data from the Social Security Administration shows $3.47 billion in workmen's compensation benefits were paid in 1971.21

Considering these costs, it's not difficult to recognize the value of an investment in safety as accident rates drop, and with them the cost of workmen's compensation, lost time, and down time.

C. Aerospace Firms

Three aerospace firms were investigated to determine the estimated cost to bring the companies into OSHA compliance in 1974.

Company A was reviewed in detail relative to the planned expenditure and their in-plant safety program related to OSHA while the review of company B and C was limited only to the cost estimate.

Company A employs approximately 6,000 people and is engaged in the aerospace field. The plant operation includes work relative to advance electronics and defense missile system design, development, testing, and manufacturing activities. The firm also maintains a basic research and technology group working in the area of new design, electronics and the physical sciences. A safety program has been in operation from the inception of the division 17 years ago when a new plant was built by the company and established as a prime missile design and manufacturing facility.

A Safety Operations Group is responsible for the plant wide safety program of the company. The program has been recently modified and upgraded to encompass the OSHA standards and regulations. The safety group organizationally is under the direct control of the Director of Contracts for the division.

The Safety Operations Group is manned with a Supervisory Safety Engineer, two safety engineers, a Loss Control/Prevention Inspector, and secretary. The Loss Control/Prevention Inspector is primarily responsible for the added requirements to attain OSHA compliance within the plant wide safety program.

The Director of the safety group is responsible to the firm for the effective management and implementation of the plant wide safety program. He has many years of experience in the industrial safety field and has developed a well organized safety program. He constantly reviews
all matters of safety, attends industrial safety seminars, and subscribes
to several important safety manuals and magazines in order to stay cur­
rent with the state of the art.

One of the safety engineers is responsible for the proper han­
dling of explosive material, the adequacy of safety procedures, and ad­
herence to the approved procedures. He has a long history of experience
in explosives handling and is well qualified for the job.

The second safety engineer has many years of experience as a
safety officer in the Navy and is responsible for the missile program
safety aspects. He works with the system design personnel and is respon­
sible for review of all missile hardware design to assure compliance to
the military users safety requirement. He plays an active role during
the system design review phase which all new systems must pass before
being released to production. He has educated himself in OSHA require­
ments to assure that all aspects of his job are in conformance to the
OSHA standards and regulations.

The third safety engineer is titled the Loss Control/Prevention
Inspector and his function has been added to the safety group since the
advent of the OSHA Act. His responsibility covers the industrial plant
facilities. He has had considerable OSHA training through formal educa­
tion, self training by review of OSHA technical bulletins, and other
OSHA sponsored training courses. He is familiar with all the applicable
OSHA standards in his area of responsibility.

The program that is employed by the safety group to meet the
Safety and OSHA requirement generally consists of the following:

1. Since an estimate of 80 percent of the safety program is
   also part of or due to the latest OSHA requirements, the
safety group has made a concentrated effort to train and update itself to OSHA compliance trends. They are familiar with the OSHA standards and can relate the proper interpretation to their particular area of responsibility.

Any work area or facility that is related to occupational safety aspects is constantly inspected. This is accomplished by a walk through program, unannounced and unscheduled, to review the general safety conditions throughout the plant and look for unsafe operators and equipment.

Each manufacturing process plan is reviewed and approved by the safety group before it can be used by the manufacturing personnel, thereby providing some assurance that new processes released for production in the plant are safe and in compliance with OSHA. The safety inspector also monitors these processes in action on the manufacturing floor to verify that the procedures are safe. Spot, unannounced inspections are conducted to assure that they are carefully followed. For example, he will monitor a cutting operation while in process and record noise level readings to determine if the noise level exceeds the OSHA standards.

New or facilities modification plans and drawings are reviewed and approved by the safety group. Again this is done to assure that the new or modified facilities meet the necessary safety requirements, as well as the latest OSHA standards.
If a violation is reported or detected, a form called "Accident Prevention Suggestion," shown in the Appendix, is used by the safety group to document the violation. The form provides for the information necessary to identify the unsafe condition or the standard that has been violated, the priority of seriousness, plant location, suggested correction, and the proposed corrective follow-up action.

The form requires a suggested correction in order for the violation to be corrected to meet the OSHA requirement. This may require design review by the facility engineers to assure that the suggested solution will be effective. The form priorities are as follows:

Priority 1 - Extensive loss of physical property may occur or cause loss of life or a permanent crippling injury

Priority 2 - Could result in extensive damage to property and may cause extensive injury

Priority 3 - May cause minor damage to facilities and minor injury to personnel

Then the original form is forwarded to the facilities division of the plant for review and corrective action. A copy is retained in a suspense file. If the facility division does not question the condition which they could appeal, the division will prepare a plan for correcting the unsafe condition. This plan will include as a minimum: The correction work schedule, the required design or maintenance change, the procurement of material, allocation of time and manpower, and the necessary funding needed to accomplish the job.

The form will be returned for record and monitoring by the safety group so that they can be assured that the facility deficiency is being corrected in compliance to the plan. Upon completion of the
job, the form is so annotated and filed for record purposes. This action serves as a record for review if an OSHA compliance officer inspects the area and demonstrates that a well managed OSHA compliance program is in effect.

The integrity of the safety group can best be explained in that they not only want to be in conformance to the standards and specifications, but to those requirements deemed to be ideal and necessary for the profession.

The program has an excellent communication system between the safety group, union, and the employees. The safety group meets once a month with a union selected safety group. The group meets for 3 to 4 hours per session and discusses both physical and employee conduct of safety. It is a well known fact that unions want help from the contractor to encourage employees to observe the safety rules. In addition, the session is used for exchanging ideas. Most all discussions in the Union Safety Committee are passed on to the union membership during the general union meetings.

The union realizes that both the contractor and employees want safety, but the contractor safety group is much more determined to promote safety than the employees. It is estimated that the employees are only aware of about 2 percent of the actions being taken by the contractor to assure a safety program.

Company safety programs were formerly based on accepted safety procedures. Now with OSHA, a mandatory coordinated program must be established in which corporate supervision is responsible for the safety of the employee.
Company A got serious about the OSHA requirement in 1972, but it wasn't until 1974 that they determined the total compliance requirement and prepared a plan for implementation and the necessary costs associated with its compliance.

In order to determine the need for corrective action due to the OSHA act and to the safety standards issued to date, the company set out to review all the standards applicable to their facility. The industry standards are found in Part 1910 of Title 29 of the Code of the Federal Register. The review in many areas required considerable interpretation for some standards for particular plant equipment and facilities are vague. The interpretations were extremely important since a great deal of time, effort and money would be wasted if the company safety engineers over reacted to specific standards.

Once deficiencies were identified, non-compliance of equipment and procedures were issued to the facility division of the company. These people reviewed all the non-compliance items and prepared the plan for corrective action programs to correct the deficiencies. Some items required simple markers or additional maintenance, but some were as far reaching as redesign of plant facilities, such as the air filtering system in the paint and plating shops and modification of noise abatement systems.

The particular areas that were designated for change were:

**Preventive Maintenance and Record Keeping**

The standard has a requirement for preventive maintenance inspectors and records maintenance beyond the present preventive maintenance program. Items included were monthly inspections of all material handling equipment (overhead cranes, monorails, etc.), resistance
welding equipment, presses, manlifts and scaffolds. The cost for implementing this requirement is $90,000. This item is expected to be a yearly recurring cost of $90,000.

The Plant Electrical System

The OSHA regulations on use of extension cords and locations outlets are well defined. There are also requirements that define the use of emergency power to light egress signs. The electrical system must be properly labeled to identify source of power for each piece of equipment and the proper instruction and procedures to turn power off in case of emergency. This area was estimated to cost $65,000 in order to meet the OSHA requirements.

Lighting

The regulations on lighting is one of the areas covered in an employee complaint to OSHA. This was due to lighting installations that are below minimum or due to poor maintenance of the existing system. Correction to the installation cited in the fabrication building would cost an estimated $40,000. The poor maintenance could be corrected by doubling the two-man relamping crew on the second shift at a cost of $22,000. This would be a recurring cost each year of plant operation. Total cost to correct lighting $62,000.

Machine Guarding

The standards require all machines to be effectively guarded. To properly protective guard all of the machine tools as presently defined by the OSHA regulation would cost about $52,000. The cost is based on the 150 machines which need work at an average cost of $350 per unit. It must be kept in mind that this estimate could escalate since
new and revised standards are still being prepared and could well cause an additional strain on the compliance plans.

Miscellaneous Items

There were some miscellaneous items such as marking edges of moving surfaces, resurfacing metal stair treads, signs indicating load limits on structures and overhead cranes, protective handrails, moving part guards, etc. Correction of these items is estimated to cost $30,000.

Capital Funds

Due to the OSHA regulations there is a requirement to improve the ventilation, dust control, noise control and lighting improvement which is estimated to cost $100,000 for design and fabrication of the hardware.

Government Equipment Responsibility

Modification of an overhead crane with a brake to meet the OSHA requirement is estimated to cost $7,096.

Modification of a sandblaster is required to assure that the air supply connection for the hood air was of a type incompatible with that of the nitrogen system, and to assure that the air supply is free of carbon monoxide when compression is oil lubricated. Cost estimate for meeting OSHA compliance is $8,398.
## Summary of Costs for Company A

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventive maintenance</td>
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</tr>
<tr>
<td>Electrical system</td>
<td>65,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>62,000</td>
</tr>
<tr>
<td>Machine guarding</td>
<td>52,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>30,000</td>
</tr>
<tr>
<td>Improved ventilation, and</td>
<td></td>
</tr>
<tr>
<td>dust and noise control</td>
<td>100,000</td>
</tr>
<tr>
<td>Government equipment</td>
<td>15,494</td>
</tr>
</tbody>
</table>

$414,494

The company planned capital expenditures for 1974 are estimated to be $5,000,000. With a program to spend $414,000 to come into OSHA compliance, this amount represents about 8 percent of capital expenditures for the year.

Although not reviewed in detail, two additional aerospace companies were selected to evaluate costs associated with the OSHA requirement. Company B is also engaged in defense work and although its facility is somewhat older than Company A, the type of work being performed in their facility is generally the same and they have approximately the same number of employees. The cost for bringing it into compliance with OSHA was $281,000. Other than normal upkeep, additional funding would be required only if standards are revised.

Company C expenditure for the OSHA compliance was approximately the same, $241,000. This company was the same relative size and facility age as Company B, and also performed missile system design, development, and production.
Neither Company B nor C information was available for a detailed review of the safety program as related to OSHA, but it is expected that their programs were similar to that of Company A.

D. Product Cost

In addition to OSHA formulated cost due to in-plant operations, there is also a fringe impact, costs resulting from a vendor reducing or eliminating a product line. This occurs when a vendor believes that OSHA compliance would cost entirely too much for him to properly compete in the market. The cost and scheduling impact on the prime company can be dramatic. The method for determining this impact becomes very difficult since the vendor supplying the item or material isn't aware of the down-stream impact, and may not know if a substitute is readily available.

If a replacement could be substituted without testing, and implementing costs are negligible, the results are not critical. However, if a substitute is not available, this impact could be very costly to the manufacturer in need of the material.

In order to more fully understand this impact situation, two major defense programs were investigated at a contractor's plant. The plan was to determine if the programs had any recent problems of vendor product cost due to an OSHA standard.

The first situation encountered was related to a material supplied by a vendor in the northwestern United States and was related to material used for potting interface and cable connectors on military hardware exposed to the environment. These cables and interface connectors were used in all-weather military systems and required that all connectors and interfaces be potted to promote weatherproofing, usually
from moisture, water, and rain encroachment. This potting material had been used in the system for a number of years and was qualified and tested for the system at a considerable expense.

The material was no longer available since the vendor stopped producing it due to an OSHA requirement. Therefore, the prime contractor had to search for a new source. The sources available were somewhat different than the one that was in use, and the new material had to be tested and qualified before it could be incorporated into the missile system.

Once the material was qualified, cost was associated with its implementation into the production line because of the usage, handling and processing required. This contractor uses manufacturing process plans which define in detail the procedures that had to be followed for proper manufacturing results. Since there are 400 different cables and assemblies which use the material, each process plan had to be changed before the material could be used in production.

Program costs for the material change that the product user was forced to pay amounted to approximately $23,000. This cost was related to the engineering cost for a substitute selection, qualification tests, and the cost for production and field maintenance incorporation.

If this product were used by other manufacturers, which is probably true, the cost to Government or industry could well approach several times this amount. The cost for correcting the suppliers OSHA standard problem might well be a viable solution rather than forcing the down-stream user who has no choice but to pay the price for changing the product.
The second area investigated was similar to the first mentioned but the material was used on a highly sophisticated missile air frame. This airframe saw tremendous shock and vibration during its high acceleration maneuvers. The material was used in a manufacturing line application as a harness holder and was molded into place to control the position of the harness in the air frame. The material was used since it was easily molded and provided excellent shock-vibration characteristics, but it presented a problem because the accelerator used during its molding process gave off a substance called "MOCA" which is injurious to the health. As a result OSHA standards required extensive modification to the work area to assure safe handling and processing.

The cost to find a new, qualified source for the material that was considered safe per the OSHA standard cost approximately $60,000. If the situation would have been detected during a full production rather than during an R&D program, the cost could well have been many times that amount.
CHAPTER III

INDUSTRIAL EQUIPMENT

The area of Industrial Equipment Manufacturers has not yet been properly addressed by OSHA. Once equipment is purchased from these manufacturers and is inspected by OSHA and the equipment is in violation of the OSHA standards, the vendor is free of the violation and the purchaser or user gets the citation. The vendor should be responsible for reviewing the applicable standards and determining which standards pertain to his particular piece of equipment and provide assurance that the equipment meets the standards.

At the present time OSHA is not yet certifying new industrial equipment as meeting standards because it is impossible for them to do with all the millions of pieces of equipment that are for sale.

Until OSHA can certify that the equipment the vendor is manufacturing and selling meets the standard, the buyer should have the vendor define the OSHA and safety standards that apply to his equipment and how his equipment meets or fails to meet these standards. This would identify a majority of the problems of non-compliance until OSHA equipment standards become a mandatory requirement prior to sale.

From these problems, it becomes quite evident that the OSHA act will be costly if industry is going to come into full compliance.22

The initial costs associated with standards interpretation, initial compliance implementation, and continual revision and updating to stay within full compliance will continue to be a very important and costly program for industry to maintain. No cost estimate was obtainable for this area of OSHA impact or when this part of the OSHA implementation will become effective.
CHAPTER IV

SUMMARY

Any public law as broad and deep as the OSHA law will require a large administrative bureaucracy for enforcement. Also, in complying with the Act, companies will need to add personnel to keep records and to acquire more safety devices and protective equipment. All of these additions cost money, and increasingly questions are being asked as to whether or not the benefits are commensurate with the cost.

It is difficult, if not impossible, to put a dollar value on human life and health. Obviously the Act will result in lower accident rates and fewer deaths from occupational hazards. Hopefully, through wise administration and careful attention to the development of standards, the success of the Act will be reasonably commensurate with the costs and effort involved.

The standards selected early in the OSHA program represented the best that could be done by a new and large Government program in a relatively short time for the amount of effort that was required. The promulgating of the new and revised standards with the help of NIOSH, the professional community, and industry are bound to lead to standards that are better and more suited to industry. These standards are being developed by research, the professional groups, and from industry that understands the implementation impact.

The data selected for this research strongly point out that there is no clean, measurable comparison relative to the cost of the
OSHA implementation. However, considerable data support the conclusion that the cost associated with the compliance is relative to the type of industry involved, the size and age of the facility, the extent of the existing safety program presently in effect, and the interest of top management in compliance.

The aerospace firms reviewed during the investigation show that approximately $400,000 is needed to bring each of them into OSHA compliance. This represents approximately 8 percent of capital expenditures for the firm for a year, which is a slightly higher percent than was determined by the McGraw-Hill Survey. However, the McGraw-Hill Survey covers many aerospace firms of varied sizes and therefore may have a tendency to be somewhat lower.

The cost per worker for an aerospace firm to come into OSHA compliance, although limited in sample size, seems to indicate approximately $400,000 for 6,000 employees or $67 per person. An additional $152,000 or $25 per person per year is necessary to assure continued compliance. The cost per person is of little importance for comparison purposes.

There is also a cost that shows up unexpectedly in the procurement of materiel for the manufacturing of end products. Materiel may simply be discontinued from the market or be removed by OSHA's direction, which may well have a serious impact on a product line that a company has been using and depending on. It could well affect the prime contractor sufficiently to jeopardize his schedules and cost estimates or even force him completely out of business.

Probably the biggest single unknown lies in the invoking of new standards and revisions of old standards as the OSHA group extends
its knowledge with its coordinated research and investigation program.

Here lies the sleeping tiger! For if the standards are revised and forced on industry without a well coordinated set of requirements, the cost could well force billions of dollars to be spent needlessly.
CHAPTER V

RECOMMENDATIONS

In order to approach the OSHA compliance program for its implementation effects; the following areas and effort should be considered to assure a program which will serve both employer and employee alike:

1. Maintain a copy of the occupational Safety and Health Act and all the standards and references to safety and health standards of all the Federal programs that apply.

2. Be familiar with the Act and all applicable standards, and stay current with all changes to the standards.

3. Assure that all employees responsible for the safety (OSHA) program are well trained for the job.

4. Have the safety organization reporting to top management.

5. Assure a good employee-employer-union communication system.

6. Initiate an effective monitoring, corrective action, follow-up program for detecting and correcting non-compliance.

7. Have a well planned cost estimate for implementing the program properly.

8. Constantly survey suppliers to assure that they are not planning to drop a product line for any reason or as a result of compliance with OSHA.

9. Consider the OSHA standards and regulations when procuring industrial equipment and tooling.
CHAPTER VI

CONCLUSIONS

Although OSHA is having a costly effect on most of industry, there is little doubt that the long awaited coverage of the act is necessary and may turn out to be a benefit in disguise rather than a burden.

The cost impact due to the mandatory requirement for OSHA compliance is quite varied. The degree of effort needed for compliance is related to the type of industry, the age of the facility, and the extent and organized safety programs in effect at the time of OSHA compliance.

If a company or firm has in existence a good safety program, employs 5,000 - 10,000 people, and is in the aerospace field, the investigation shows that approximately $400,000 would be necessary to bring the company into OSHA compliance. Additional expenditures of smaller amounts are expected as yearly recurring costs to keep the safety program and facility in continued compliance.
### APPENDIX

### ACCIDENT PREVENTION SUGGESTION

**Company A**

<table>
<thead>
<tr>
<th>TO:</th>
<th>FROM:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PRIORITY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Any condition or practice with potential for causing loss of life or body part and/or extensive loss of structure or material.</td>
</tr>
<tr>
<td>2</td>
<td>Any condition or practice with potential for causing serious injury or property damage.</td>
</tr>
<tr>
<td>3</td>
<td>Any condition or practice with probable potential for causing non-disabling injury or non-destructive property damage.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXACT LOCATION</th>
<th>BUILDING NO.</th>
<th>COLUMN NO.</th>
<th>EQUIPMENT NO.</th>
</tr>
</thead>
</table>

**Hazard Priority**

- [ ] PRIORITY 1
- [ ] PRIORITY 2
- [ ] PRIORITY 3

**Condition or Practice Noted**

**A. Temporary**

**B. Permanent**

**Distribution:** White - Facilities, Pink - Safety, Goldenrod - Area Manager

**Safety Dept.**
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